

What is claimed is:

1. A method of manufacturing a solid-state imaging device comprising the steps of:

forming a plurality of IT-CCDs on a surface of a semiconductor substrate;

5 bonding a translucent member to the surface of the semiconductor substrate in order to have a gap opposite to each light receiving region of the IT-CCD;

forming an external connecting terminal corresponding to the IT-CCD; and

10 isolating a bonded member obtained at the bonding step and provided with the external connecting terminal for each of the IT-CCDs.

2. The method of manufacturing a solid-state imaging device according to Claim 1,

wherein the step of bonding a translucent member includes the steps of:

5 preparing a translucent substrate having a concave portion in a position corresponding to a region in which the IT-CCD is to be formed; and

bonding the translucent substrate to the surface of the semiconductor substrate.

3. The method of manufacturing a solid-state imaging device according to Claim 1, prior to the bonding step,

further comprising the step of:

selectively removing the surface of the  
5 semiconductor substrate to surround the light receiving  
region, thereby forming a protruded portion, a gap being  
formed between the light receiving region and the  
translucent member by the protruded portion.

4. The method of manufacturing a solid-state imaging  
device according to Claim 1,

wherein at the bonding step, a gap is formed  
between the semiconductor substrate and the translucent  
5 member through a spacer provided to surround the light  
receiving region.

5. The method of manufacturing a solid-state imaging  
device according to any of Claims 1 to 4,

wherein the isolating step includes the step of  
separating the translucent member to position a peripheral  
5 edge portion of the translucent member onto an inside of a  
peripheral edge portion of the IT-CCD in such a manner that  
a surface of a peripheral edge portion of the IT-CCD is  
exposed from the translucent member.

6. The method of manufacturing a solid-state imaging  
device according to Claim 1 or Claim 2,

wherein said step of bonding is performed at a

temperature under 80 degrees C.

7. The method of manufacturing a solid-state imaging device according to Claim 6,

wherein, in the bonding step, a room temperature setting adhesive is utilized for bonding the translucent member to the surface of the semiconductor substrate.

8. The method of manufacturing a solid-state imaging device according to Claim 6,

wherein, in the bonding step, a photo-curing adhesive is utilized for bonding the translucent member to the surface of the semiconductor substrate.

9. The method of manufacturing a solid-state imaging device according to Claim 1 or Claim 2, prior to said step of isolating, further comprising the step of:

resin shielding for shielding the translucent member in vicinity of the bonding link with the surface of the semiconductor substrate by a resin so that the external connecting terminal is exposed.

10. The method of manufacturing a solid-state imaging device according to Claim 9,

wherein the resin shielding step is performed at a temperature under 80 degree C.

11. A solid-state imaging device comprising:  
a semiconductor substrate provided with an IT-CCD;  
and  
a translucent member connected to the semiconductor  
5 substrate in order to have a gap opposite to a light  
receiving region of the IT-CCD,  
wherein a connecting terminal is provided on a  
surface of the translucent member which is opposed to an  
attached surface of the semiconductor substrate, and  
10 the connecting terminal is electrically connected  
to the semiconductor substrate via a through hole provided  
in the translucent member.

12. The solid-state imaging device according to Claim  
11,

wherein the translucent member is connected to the  
semiconductor substrate through a spacer.

13. The solid-state imaging device according to Claim  
12,

wherein the spacer is constituted by the same  
material as that of the translucent member.

14. The solid-state imaging device according to Claim  
12,

wherein the spacer is constituted by the same material as that of the semiconductor substrate.

15. The solid-state imaging device according to Claim 12,

wherein the spacer is constituted by a resin material.

16. The solid-state imaging device according to any of Claims 11 to 14,

wherein the spacer is constituted by a 42-alloy or silicon.

17. A method of manufacturing a solid-state imaging device, comprising the steps of:

forming a plurality of IT-CCDs on a surface of a semiconductor substrate;

5 bonding a translucent member having a through hole filled with a conductive material on the surface of the semiconductor substrate in order to have a gap opposite to each light receiving region of the IT-CCD; and

isolating a bonded member obtained at the bonding  
10 step every IT-CCD.

18. The method of manufacturing a solid-state imaging device according to Claim 17, wherein the step of bonding a

translucent member includes the steps of:

preparing a translucent substrate having a  
5 plurality of concave portions in positions corresponding to  
regions in which the IT-CCDs are to be formed and a through  
hole in the vicinity of the concave portions; and

bonding the translucent substrate to the surface of  
the semiconductor substrate.

19. The method of manufacturing a solid-state imaging  
device according to Claim 18, further comprising:

the step of forming a protruded portion on the  
surface of the semiconductor substrate to surround the  
5 light receiving region prior to the bonding step, a gap  
being formed between the light receiving region and the  
translucent member by the protruded portion.

20. The method of manufacturing a solid-state imaging  
device according to Claim 18,

wherein at the bonding step, a gap is formed  
between the semiconductor substrate and the translucent  
5 member through a space provided to surround the light  
receiving region.

21. A solid-state imaging device comprising:

a semiconductor substrate provided with an IT-CCD;  
and

a translucent member connected to the semiconductor  
5 substrate in order to have a gap opposite to a light  
receiving region of the IT-CCD,

wherein the translucent member constitutes an  
optical member having a condensing function.

22. The solid-state imaging device according to Claim  
21,

wherein the translucent member is connected to the  
semiconductor substrate through a spacer.

23. The solid-state imaging device according to Claim  
22,

wherein the spacer is constituted by the same  
material as that of the translucent member.

24. The solid-state imaging device according to Claim  
22,

wherein the spacer is constituted by the same  
material as that of the semiconductor substrate.

25. The solid-state imaging device according to Claim  
22,

wherein the spacer is constituted by a resin  
material.

26. The solid-state imaging device according to any of Claims 21 to 24,

wherein the spacer is constituted by a 42-alloy or silicon.

27. The solid-state imaging device according to Claim 22,

wherein a surface of a peripheral edge portion of the IT-CCD is exposed from the translucent member.

28. The solid-state imaging device according to Claim 27,

wherein the exposed portion comprises a connecting terminal.

29. A method of manufacturing a solid-state imaging device, comprising the steps of:

forming a plurality of IT-CCDs on a surface of a semiconductor substrate;

5        bonding an optical member having a condensing function on the surface of the semiconductor substrate in order to have a gap opposite to each light receiving region of the IT-CCD; and

         isolating a bonded member obtained at the bonding  
10 step every IT-CCD.



30. The method of manufacturing a solid-state imaging device according to Claim 29, wherein the step of bonding a translucent member includes the steps of:

preparing a translucent substrate including a  
5 plurality of concave portions in positions corresponding to regions in which the IT-CCDs are to be formed and having a condensing function; and

bonding the translucent substrate to the surface of the semiconductor substrate.

31. The method of manufacturing a solid-state imaging device according to Claim 29, further comprising the step of:

forming a protruded portion on the surface of the  
5 semiconductor substrate to surround the light receiving region prior to the bonding step, a gap being formed between the light receiving region and the translucent member by the protruded portion.

32. The method of manufacturing a solid-state imaging device according to Claim 29,

wherein at the bonding step, a gap is formed between the semiconductor substrate and the translucent  
5 member through a spacer provided to surround the light receiving region.

33. The method of manufacturing a solid-state imaging device according to any of Claims 29 to 32,

wherein the isolating step includes the step of cutting the translucent member to position a peripheral edge portion of the translucent member on an inside of a peripheral edge portion of the IT-CCD in such a manner that a surface of the peripheral edge portion of the IT-CCD is exposed from the translucent member.

34. A solid-state imaging device comprising:

a first semiconductor substrate provided with an IT-CCD; and

a translucent member having a condensing function which is connected to the first semiconductor substrate in order to have a gap opposite to a light receiving region of the IT-CCD,

wherein a second semiconductor substrate constituting a peripheral circuit is provided on the first semiconductor substrate.

35. The solid-state imaging device according to Claim 34,

wherein the translucent member is connected to the semiconductor substrate through a spacer.

36. The solid-state imaging device according to Claim

35,

wherein the spacer is constituted by the same material as that of the translucent member.

37. The solid-state imaging device according to Claim 35,

wherein the spacer is constituted by the same material as that of the first semiconductor substrate.

38. The solid-state imaging device according to Claim 35,

wherein the spacer is constituted by a resin material filled between the translucent member and the  
5 first semiconductor substrate.

39. The solid-state imaging device according to Claim 35,

wherein a surface of a peripheral edge portion of each of IT-CCDs of the first semiconductor substrate is  
5 exposed from the translucent member.

40. The solid-state imaging device according to Claim 39,

wherein the exposed portion comprises a connecting terminal.

41. A method of manufacturing a solid-state imaging device, comprising the steps of:

forming a plurality of IT-CCDs on a surface of a first semiconductor substrate;

5 forming a peripheral circuit on a surface of a second semiconductor substrate;

bonding an optical member having a condensing function on the surface of the first semiconductor substrate and the second semiconductor substrate in order  
10 to have a gap opposite to each light receiving region of the IT-CCD; and

isolating a bonded member obtained at the bonding step every IT-CCD.

42. A solid-state imaging device comprising:

a first semiconductor substrate provided with an IT-CCD; and

a translucent member connected to the first  
5 semiconductor substrate in order to have a gap opposite to a light receiving region of the IT-CCD,

wherein a second semiconductor substrate having a peripheral circuit formed thereon is provided on a surface opposed to a surface of the first semiconductor substrate  
10 on which the IT-CCD is to be formed, and

the peripheral circuit is connected to the IT-CCD via a through hole provided on the first semiconductor

substrate.

43. The solid-state imaging device according to Claim 42,

wherein the first and second semiconductor substrates are bonded to each other directly.

44. The solid-state imaging device according to Claim 42,

wherein the first and second semiconductor substrates are bonded to each other with an adhesive layer  
5 in between.

45. The solid-state imaging device according to Claim 42,

wherein the first and second semiconductor substrates are bonded to each other with a heat insulating  
5 material in between.

46. The solid-state imaging device according to Claim 42,

wherein the first and second semiconductor substrates are bonded to each other with a magnetic shield  
5 material in between.

47. A method of manufacturing a solid-state imaging

device, comprising the steps of:

forming a plurality of IT-CCDs on a surface of a first semiconductor substrate;

5        forming a peripheral circuit on a surface of a second semiconductor substrate;

      bonding a translucent member onto the surface of the first semiconductor substrate in order to have a gap opposite to each light receiving region of the IT-CCD;

10       bonding the second semiconductor substrate to a back side of the first semiconductor substrate;

      forming a through hole on the first semiconductor substrate before or after the bonding step and the semiconductor substrate bonding step and electrically  
15       connecting the IT-CCD to a back face of the first semiconductor substrate; and

      isolating a bonded member obtained at the bonding step every IT-CCD.

48.       The method of manufacturing a solid-state imaging device according to Claim 47,

      wherein at the semiconductor substrate bonding step, the first and second semiconductor substrates are  
5       bonded to each other by direct bonding.

49.       The method of manufacturing a solid-state imaging device according to Claim 47,

wherein at the semiconductor substrate bonding  
step, the first and second semiconductor substrates are  
5 bonded to each other with an adhesive layer in between.